

1. An organic optoelectronic device comprising:

a first electrode;

a hole transport layer;

a luminescent layer;

5 an active layer; and

a second electrode,

wherein at least one of the layers selected from the group consisting of the hole transport layer, the active layer, and the electron transport layer, and combinations thereof, comprises a crosslinked molecularly doped polymer layer.

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2. The organic optoelectronic device of claim 1, further comprising a charge injection layer.

15 3. The organic optoelectronic device of claim 1, further comprising a hole blocking layer.

4. The organic optoelectronic device of claim 1, wherein the first electrode comprises a transparent conductive oxide.

20 5. The organic optoelectronic device of claim 1, wherein the second electrode comprises a metal cathode.

6. The organic optoelectronic device of claim 1, wherein the active layer is selected from light emitting layers, light absorbing layers, and electric current generating layers.

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7. The organic optoelectronic device of claim 1, wherein the hole transport layer is the molecularly doped polymer layer and wherein a molecular dopant is selected from tertiary aromatic amines.

8. The organic optoelectronic device of claim 1, wherein the active layer is the molecularly doped polymer layer and wherein a molecular dopant is selected from metal (8-quinolinolato) chelates, quinacridone derivatives, and triaryl amine derivatives.

5 9. The organic optoelectronic device of claim 1, wherein the electron transport layer is the molecularly doped polymer layer and wherein a molecular dopant is selected from metal (8-quinolinolato) chelates.

10. A method of making an organic optoelectronic device comprising:

10 depositing a first electrode adjacent a substrate;
depositing a hole transport layer adjacent the first electrode;
depositing an active layer adjacent the hole transport layer;
depositing an electron transport layer adjacent the active layer; and
depositing a second electrode adjacent the electron transport layer,

15 wherein at least one of the layers selected from the group consisting of the hole transport layer, the active layer, and the electron transport layer, and combinations thereof, comprises a crosslinked molecularly doped polymer layer.

11. The method of claim 10 wherein the molecularly doped polymer layer is made by:

20 mixing a liquid polymer precursor with molecular dopant forming a molecularly doped polymer precursor mixture;

flash evaporating the molecularly doped polymer precursor mixture forming a composite vapor; and

25 cryocondensing the composite vapor on a cool substrate forming a cryocondensed composite molecularly doped polymer precursor layer and cross linking the cryocondensed composite molecularly doped polymer precursor layer thereby forming a layer of the composite polymer of the molecularly doped polymer.

12. The method of claim 10, further comprising depositing a charge injection layer adjacent to the first electrode before the hole injection layer is deposited.
13. The method of claim 10, further comprising depositing a hole blocking layer adjacent to the electron transport layer before the second electrode is deposited.
14. The method of claim 10, wherein the first electrode comprises a transparent conductive oxide.
- 10 15. The method of claim 10, wherein the second electrode comprises a metal cathode.
16. The method of claim 10, wherein the active layer is selected from light emitting layers, light absorbing layers, and electric current generating layers.
- 15 17. The method of claim 10, wherein the hole transport layer is the molecularly doped polymer layer and wherein a molecular dopant is selected from tertiary aromatic amines.
18. The method of claim 10, wherein the active layer is the molecularly doped polymer layer and wherein a molecular dopant is selected from metal (8-quinolinolato) chelates, quinacridone derivatives, and triaryl amine derivatives.
- 20 19. The method of claim 10, wherein the electron transport layer is the molecularly doped polymer layer and wherein a molecular dopant is selected from metal (8-quinolinolato) chelates.

20. The method as recited in claim 11, wherein flash evaporating comprises:
supplying a continuous liquid flow of the molecularly doped polymer precursor mixture into a vacuum environment at a temperature below both the decomposition temperature and the polymerization temperature of the molecularly doped polymer precursor mixture;

5 continuously atomizing the molecularly doped polymer precursor mixture into a continuous flow of droplets; and

continuously vaporizing the droplets by continuously contacting the droplets on a heated surface having a temperature at or above a boiling point of the liquid polymer

10 precursor and of the molecular dopant, but below a pyrolysis temperature, forming the composite vapor.

21. The method as recited in claim 20, wherein the molecular dopant has a boiling point below a temperature of the heated surface.

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22. The method as recited in claim 20, wherein the droplets are selected from molecular dopant alone, molecular dopant surrounded by liquid polymer precursor, or liquid polymer precursor alone.

20 23. The method as recited in claim 20 wherein the droplets range in size from about 1 micrometer to about 50 micrometers.

24. The method as recited in claim 11 wherein flash evaporating comprises:
supplying a continuous liquid flow of the molecularly doped polymer precursor mixture into a vacuum environment at a temperature below both the decomposition temperature and the polymerization temperature of the molecularly doped polymer precursor mixture; and

25 continuously directly vaporizing the liquid flow of the molecularly doped polymer precursor mixture by continuously contacting the molecularly doped polymer precursor

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mixture on a heated surface having a temperature at or above a boiling point of the liquid polymer precursor and of the molecular dopant, but below a pyrolysis temperature, forming the composite vapor.